REMARKS

This communication is in response to the Office Action dated November 17, 2004. Claims 1-15 and 31-38 were elected without traverse in the reply filed on 10/18/2004. Claims 1, 11, 12, 31 and 38 were amended for clarification. Claim 39 was added. Claims 1-15 and 31-38 have been rejected. Claims 1-15 and 31-39 remain pending in the present Application.

A first aspect of the present invention is a thin film device. The thin film device includes at least one patterned thin film layer, a heater material coupled to the at least one patterned thin film layer for providing thermal assistance to the at least one patterned thin film layer wherein the heater material comprises at least one of amorphous silicon and amorphous carbon and a conductor coupled to the heater material for supplying energy to the heater material. Accordingly, a heater material is utilized to thermally assist in the operation of the thin film device. By utilizing a heater material to thermally assist in the operation of the thin film device, a substantial improvement in the accuracy and performance of the thin film device is achieved.

Drawings

The Examiner states:

> **The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "sensor" of claim 3 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.**

Applicant respectfully asserts that Claim 3 has been canceled to overcome the above-referenced informality.

Claim Objections

The Examiner states:

> **Claims 11 and 12 are objected to because of the following informalities. Each of claims 11 and 12 recites: "The device of claim 6 wherein the magnetic memory element" which lacks an antecedent basis. It is clear that the "magnetic memory element" is cited in claim 7.**

Applicant respectfully asserts that Claims 11 and 12 have been amended to overcome the above-referenced informality.

§102 Rejections

For ease of review, Applicant reproduces independent Claims 1, 31 and 38 herein below:

1. A thin film device comprising:

at least one patterned thin film layer;

a heater material coupled to at least one of the patterned thin film layers for providing thermal assistance thereto wherein the heater material comprises at least one of amorphous silicon and amorphous carbon; and

a conductor coupled to the heater material to supply energy to the heater material.

31. A computer system comprising:

a processor;

an interface module coupled to the processor; and

a magnetic random access memory device coupled to the interface module wherein the magnetic random access memory device includes a plurality of magnetic

memory elements, a heater material coupled to at least one of the plurality of magnetic memory elements for providing thermal assistance in switching a magnetic orientation of the at least one of the plurality of magnetic memory elements and a conductor coupled to the heater material for supplying energy to the heater material wherein the conductor is a split conductor and the heater material is connected between the split conductor.

38. A magnetic random access memory device comprising:

a plurality of magnetic memory elements;

a heater material coupled to at least one of the plurality of magnetic memory elements wherein the heater material comprises at least one of amorphous silicon and amorphous carbon;

a decoder coupled to the heater material; and

a radio frequency power source coupled to the decoder for providing heat to the heater material to thermally assist in switching a magnetic orientation of the at least one of the plurality of magnetic memory elements.

Chiang reference

The Examiner states:

> **Claims 1, 4-6, 10 and 14-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Chiang et al. U.S. Patent 6,339,544 (hereinafter referred to as the '544 patent).**

Applicant respectfully disagrees. Claim 1 recites a thin film device that includes at least one patterned thin film layer, a heater material coupled to the at least one patterned thin film layer for providing thermal assistance to the at least

one patterned thin film layer and a conductor coupled to the heater material for supplying energy to the heater material.

The Examiner asserts that the Chiang reference anticipates the claimed invention. The Chiang reference discloses an apparatus including a contact on a substrate, a dielectric material overlying the contact, a phase change element overlying the dielectric material on a substrate, and a heater element disposed in the dielectric material and coupled to the contact and the phase change element, wherein a portion of the dielectric material comprises a thermal conductivity less than silicon dioxide. The Chiang reference also discloses a method including introducing over a contact formed on a substrate, a dielectric material, a portion of which comprises a thermal conductivity less than silicon dioxide, introducing a heater element through the dielectric material to the contact, and introducing a phase change material over the dielectric material and the heater element.

Specifically, claim 1 has been amended to recite "..wherein the heater material comprises at least one of amorphous silicon and amorphous carbon". The Examiner asserts that element 250 of the Chiang reference is a heater material as recited in claim 1 of the present invention. Applicant respectfully disagrees. Element 250 of the Chiang reference is a dielectric material (see Chiang col. 7 lines 5-9). A dielectric material is a substance that is a poor conductor of electricity, but an efficient supporter of electrostatic fields. In practice, most dielectric materials are solid. Examples include porcelain (ceramic), mica, glass, plastics, and the oxides of various metals.

Applicant accordingly asserts that a heater material that comprises at least one of amorphous silicon and amorphous carbon is clearly distinguishable from a dielectric material as disclosed in the Chiang reference. Stated another way, the utilization of a heater material that comprises at least one of amorphous silicon and amorphous carbon is not anticipated by the utilization of a dielectric material as disclosed by the Chiang reference. Consequently, claim 1 is not anticipated by the Chiang reference.

Since Claims 4-6, 10 and 14-15 are dependent on Claim 1, the above-articulated argument with regard to Claim 1 applies with equal force to claims 4-6, 10 and 14-15. Accordingly, Claim 4-6, 10 and 14-15 should be allowed over this reference.

Hamann reference

The Examiner states:

> **Claims 1, 3, 5, 10 and 14 are rejected under 35 U.S.C. 103(a) as being anticipated by Hamann et al. (US 6233206).**

Applicant respectfully disagrees. The Hamann reference discloses an assembly that writes by way of thermal near-field coupling between a thermal heater and a media. The thermal heater may comprise an atomic force microscope probe or a magnetic force microscope and preferably reads by way of a local magnetic sensor preferably comprising a magnetic force microscope which can yield spatial resolutions down to e.g., 250 .ANG.

Specifically, claim 1 has been amended to recite "..wherein the heater material comprises at least one of amorphous silicon and amorphous carbon". The Examiner asserts that the center film of Fig 5C in the Hamann reference is a heater material as recited in claim 1 of the present invention. Applicant respectfully disagrees. The center film of Fig 5C of the Hamann reference is a non-conducting material (see Hamann col. 6 lines 63-64).

Applicant accordingly asserts that a heater material that comprises at least one of amorphous silicon and amorphous carbon is clearly distinguishable from a non-conducting material as disclosed in the Hamann reference. Stated another way, the utilization of a heater material that comprises at least one of amorphous silicon and amorphous carbon is not anticipated by the utilization of a non-conducting material as disclosed by the Hamann reference. Consequently, claim 1 is not anticipated by the Hamann reference.

Since Claims 5, 10 and 14 are dependent on Claim 1, the above-articulated argument with regard to Claim 1 applies with equal force to Claims 5, 10 and 14. Accordingly, Claims 5, 10 and 14 should be allowed over this reference.

Abraham reference

The Examiner states:

> **Claims 1, 2, 7, 11, 12 and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Abraham et al. (US 6385082).**

Applicant respectfully disagrees. The Abraham reference discloses a memory array of storage cells that comprises an array of electrically conducting bit lines and electrically conducting word lines which form intersections therebetween, a storage cell disposed at each of said intersections, each storage cell comprising at least one reversible magnetic region or layer characterized by a magnetization state which can be reversed by applying thereto a selected external magnetic field, said reversible magnetic layer comprising a material whose magnetization state is more easily reversed upon a change in the temperature thereof, and a temperature change generator for changing the temperature of said reversible magnetic layer of only a selected one of said array of storage cells at any moment. To select a cell, it is preferable to select a cell by using a brief pulse of tunnelling current between the intersecting bit and word lines at that cell in order to provide sufficient Joule heating to facilitate a change in the magnetization state of its reversible magnetic layer, which preferably comprises a ferromagnetic material.

Specifically, Claims 1 and 38 have been amended to recite "..wherein the heater material comprises at least one of amorphous silicon and amorphous carbon". The Examiner asserts that the recited heater material is generally represented in the Abraham reference by cell 50 and powered by voltage source 54 whereby "material" is interpreted broadly. Applicant respectfully disagrees. Cell 50 of the Abraham reference is described in col. 5 lines 12-27:

> Storage cell 50 is formed of a number of vertically stacked regions or layers. In particular, cell 50 comprises both a fixed or

"pinned" reference layer 52 and a reversible or "free" layer 51 separated by an electrically insulating tunnel barrier layer 53. As will be understood from Gallagher et al, supra, The magnetization of pinned layer 52 is oriented in the plane of the layer but is fixed so that it may not be rotated or reversed in the presence of an applied external magnetic fields generated by write currents through bit line 5 and word line 2. By contrast, the magnetization of free layer 51 can be rotated (or reversed) in the plane of layer 51 relative to the fixed magnetization of layer 52. The amount of tunnelling current that flows perpendicularly through magnetic layers 51, 52 and through the intermediate tunnelling insulating layer 53 (e.g. Al_2O_3) depends on the relative magnetization directions of magnetic layers 51 and 52.

Applicant accordingly asserts that the cell 50 of the Abraham reference does not disclose, teach or suggest the implementation of a heater material coupled to at least one patterned thin film layer as recited in claims 1 and 38 of the present invention. Abraham simply discloses a memory cell 50 that is capable of being heated. Consequently, since the Abraham reference does not disclose, teach or suggest the implementation of a heater material coupled to at least one patterned thin film layer as recited in claims 1 and 38 of the present invention, claims 1 and 38 are not anticipated by the Abraham reference.

Since Claims 2, 7 11 and 12 are dependent on Claim 1, the above-articulated argument with regard to Claim 1 applies with equal force to Claims 2, 7 11 and 12. Accordingly, Claims 2, 7 11 and 12 should be allowed over this reference.

Leuschner reference

The Examiner states:

> **Claims 1, 2, 6-7, 11-13, and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Leuschner et al. (US 6704220).**

Applicant respectfully disagrees. The Leuschner reference discloses a resistive memory device and method of manufacturing thereof including magnetic memory cells having a second magnetic layer including at least a first and second material. The Curie temperature of the second material is lower than the Curie temperature of the first material. A plurality of non-continuous second conductive lines are disposed over the magnetic memory cells. A current may be run through the second conductive lines to increase the temperature of the second material to a temperature greater than the second material Curie temperature, causing the second material to lose its ferromagnetic properties, providing increased write selectivity to the memory array.

Specifically, claims 1 and 38 have been amended to recite "..wherein the heater material comprises at least one of amorphous silicon and amorphous carbon". The Examiner asserts that material 26 of the Leuschner reference constitutes a heater material as recited in claims 1 and 38 of the present invention. Applicant respectfully disagrees. The material 26 of the Leuschner reference comprises a ferromagnetic material with a relatively low Curie temperature, such as alloys of ferromagnetic elements with non-ferromagnetic elements, such as alloys of Co or Ni with Cr, Mn, V or combinations thereof as examples (see Leuschner col. 6 lines 52-56).

Applicant accordingly asserts that a heater material that comprises at least one of amorphous silicon and amorphous carbon is clearly distinguishable from a ferromagnetic material with a relatively low Curie temperature as disclosed in the Leuschner reference. Stated another way, the utilization of a heater material that comprises at least one of amorphous silicon and amorphous carbon is not anticipated by the utilization of a ferromagnetic material with a relatively low Curie temperature as disclosed by the Leuschner reference. Consequently, claims 1 and 38 are not anticipated by the Leuschner reference.

Since Claims 2, 6-7 and 11-13 are dependent on Claim 1, the above-articulated argument with regard to Claim 1 applies with equal force to Claims 2, 6-7 and 11-13. Accordingly, Claims 2, 6-7 and 11-13 should be allowed over this reference.

Abraham reference ('674)

The Examiner states:

> **Claims 1, 2, 4, 7-9, and 11-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Abraham et al. (US 6724674).**

Applicant respectfully disagrees. The '674 reference discloses a memory storage device that includes a storage cell having a changeable magnetic region. The changeable magnetic region includes a material having a magnetization state that is responsive to a change in temperature. The memory storage device also includes a heating element. The heating element is proximate to the storage cell for selectively changing the temperature of the changeable magnetic region of said storage cell. By heating the storage cell via the heating element, as opposed to heating the storage cell by directly applying current thereto, more flexibility is provided in the manufacture of the storage cells.

Specifically, Claim 1 has been amended to recite "..wherein the heater material comprises at least one of amorphous silicon and amorphous carbon". The Examiner asserts that element 56 of the '674 reference constitutes a heater material as recited in Claim 1 of the present invention. Applicant respectfully disagrees. Disclosed example materials for element 56 are tungsten, copper, aluminum and doped silicon (see Abraham col. 6 lines 17-19). Applicant accordingly asserts that a heater material that comprises at least one of amorphous silicon and amorphous carbon is clearly distinguishable from the heating element disclosed in the '674 reference.

Furthermore, claim 5 of the present invention recites "wherein the conductor is a split conductor and the heater material is connected between the split conductor". This concept is clearly shown in Figure 2 of the present invention. The sidewall material 222 can be referred to as a "split" conductor since the sidewall material 222 is split and covers opposite sides of the dielectric material 230. The '674 reference does not teach or suggest this type of conductor.

Moreover, Applicant asserts that newly added claim 39 recites "wherein the conductor is a split conductor and the heater material is connected between the split conductor". Based on the above-delineated line of reasoning, the '674 reference does not teach or suggest these elements. Consequently, claims 1 and 39 are allowable over the '674 reference.

Since Claims 2, 4, 7, 9 and 11-12 are dependent on Claim 1, the above-articulated argument with regard to Claim 1 applies with equal force to Claims 2, 4, 7, 9 and 11-12. Accordingly, Claims 2, 4, 7, 9 and 11-12 should be allowed over this reference.

§103 Rejections

Abraham reference ('082)

The Examiner states:

> **Claims 31 and 32 are rejected under 35 U.S.C. 103 (a) as being unpatentable over the '082 patent.**

Applicant respectfully disagrees. When making an obvious rejection under 35 U.S.C. § 103, a necessary condition is that the reference or combination of the cited references ***must teach or suggest all claim limitations***. (Emphasis added.) If the cited reference(s) do not teach or suggest every element of the claimed invention, then the cited reference(s) fail to render obvious the claimed invention, i.e. the claimed invention is distinguishable over the combination of the cited reference(s). Applicant accordingly disagrees with the Examiner's obviousness rejection.

Applicant asserts that claim 31 recites "...a magnetic random access memory device coupled to the interface module wherein the magnetic random access memory device includes a plurality of magnetic memory elements, ***a heater material coupled to at least one of the plurality of magnetic memory elements for providing thermal assistance in switching a magnetic orientation of the at least one of the plurality of magnetic memory elements***..."(Emphasis

added). As articulated above, the cell 50 of the '082 reference does not disclose, teach or suggest the implementation of a heater material coupled to at least one of a plurality of magnetic memory elements as recited in Claim 31 of the present invention. Abraham simply discloses a memory cell 50 that is capable of being heated. Consequently, since the Abraham reference does not disclose, teach or suggest the implementation of a heater material as recited in Claim 31 of the present invention, Claim 31 is allowable over the Examiner's obviousness rejection.

Since Claim 32 is dependent on Claim 31, the above-articulated argument with regard to Claim 31 applies with equal force to Claim 32. Accordingly, Claim 32 should be allowed over this reference.

Abraham reference ('674)

The Examiner states:

> **Claims 31-33 and 35 are rejected under 35 U.S.C. 103 (a) as being unpatentable over the '674 patent (Abraham et al. (US 6724674)).**

Applicant respectfully disagrees. Applicant asserts that claim 31 has been amended to recite "wherein the conductor is a split conductor and the heater material is connected between the split conductor". As addressed above, the '674 reference does not teach or suggest the implementation of split conductor as recited in claim 31 of present invention. Consequently, the Abraham reference does not teach or suggest each limitation in the recited claim 31. Accordingly, since the Abraham reference does not teach or suggest each limitation in the recited claim 31, claim 31 is allowable over the Examiner's obviousness rejection.

Since Claims 32, 33, and 35 are dependent on Claim 31, the above-articulated argument with regard to Claim 31 applies with equal force to Claims 32, 33, and 35. Accordingly, Claims 32, 33, and 35 should be allowed over this reference.

Claim 34

The Examiner states:

> **Claim 34 is rejected under 35 U.S.C. 103 (a) as being unpatentable over the '674 patent as applied above and further in view of Hamann et al. ('186).**

Since Claims 34 is dependent on Claim 31, the above-articulated argument with regard to Claim 31 applies with equal force to Claim 31. Accordingly, Claim 34 should be allowed over the Examiner's proposed combination of references.

Claims 36 and 37

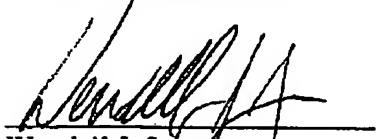
The Examiner states:

> **Claims 36 and 37 are rejected under 35 U.S.C. 103 (a) as being unpatentable over the '674 patent as applied above and further in view of Lowrey et al. (6,764,897).**

Since Claims 36 and 37 are dependent on Claim 31, the above-articulated argument with regard to Claim 31 applies with equal force to Claims 36 and 37. Accordingly, Claims 36 and 37 should be allowed over the Examiner's proposed combination of references.

Applicant believes that this application is in condition for allowance. Accordingly, Applicant respectfully requests reconsideration, allowance and passage to issue of the claims as now presented. Should any unresolved issues remain, Examiner is invited to call Applicant's attorney at the telephone number indicated below.

Respectfully submitted,



Wendell J. Jones
Attorney for Applicant
Reg. No. 45,961
(408) 938-0980